This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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1. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{1950}{10}} + \sqrt{182}i$$

The solution is Nonreal Complex, which is option B.

A. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

B. Nonreal Complex

* This is the correct option!

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

D. Pure Imaginary

This is a Complex number ($a + bi$) that **only** has an imaginary part like $2i$.

E. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

2. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{21}{0}}$$

The solution is Not a Real number, which is option C.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

B. Irrational

These cannot be written as a fraction of Integers.

C. Not a Real number

* This is the correct option!

D. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

E. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $-\sqrt{\frac{21}{0}}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

3. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{484}{169}}$$

The solution is Rational, which is option A.

A. Rational

* This is the correct option!

B. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

C. Irrational

These cannot be written as a fraction of Integers.

D. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

E. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $\frac{22}{13}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

4. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{27 - 22i}{-1 - 7i}$$

The solution is $2.54 + 4.22i$, which is option C.

A. $a \in [-27.5, -26.5]$ and $b \in [2.5, 4]$

$-27.00 + 3.14i$, which corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [-4.5, -3]$ and $b \in [-4, -3]$

$-3.62 - 3.34i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

C. $a \in [1, 3.5]$ and $b \in [4, 5.5]$

* $2.54 + 4.22i$, which is the correct option.

D. $a \in [126.5, 128.5]$ and $b \in [4, 5.5]$

$127.00 + 4.22i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [1, 3.5]$ and $b \in [210.5, 211.5]$

$2.54 + 211.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

5. Simplify the expression below and choose the interval the simplification is contained within.

$$11 - 16^2 + 12 \div 14 * 7 \div 4$$

The solution is -243.500, which is option C.

A. $[268.3, 269.8]$

268.500, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

B. $[264.2, 267.3]$

267.031, which corresponds to two Order of Operations errors.

C. $[-243.8, -241.2]$

* -243.500, this is the correct option

D. $[-246.8, -244.4]$

-244.969, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

6. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{-27 - 55i}{4 + i}$$

The solution is $-9.59 - 11.35i$, which is option B.

A. $a \in [-11, -9]$ and $b \in [-194, -191]$

$-9.59 - 193.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

B. $a \in [-11, -9]$ and $b \in [-12, -10.5]$

* $-9.59 - 11.35i$, which is the correct option.

C. $a \in [-3.5, -2]$ and $b \in [-16.5, -14]$

$-3.12 - 14.53i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

D. $a \in [-163.5, -162.5]$ and $b \in [-12, -10.5]$

$-163.00 - 11.35i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [-7, -6]$ and $b \in [-56, -54]$

$-6.75 - 55.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

7. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{64}{625}} + 64i^2$$

The solution is Rational, which is option E.

A. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

B. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

C. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

D. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

E. Rational

* This is the correct option!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

8. Simplify the expression below and choose the interval the simplification is contained within.

$$3 - 10^2 + 1 \div 20 * 15 \div 18$$

The solution is -96.958, which is option C.

A. $[103.02, 103.06]$

103.042, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

B. $[102.99, 103.01]$

103.000, which corresponds to two Order of Operations errors.

C. $[-96.98, -96.94]$

* -96.958, this is the correct option

D. $[-97.01, -96.99]$

-97.000, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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9. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(8 - 10i)(6 - 5i)$$

The solution is $-2 - 100i$, which is option C.

A. $a \in [-2, 1]$ and $b \in [94, 105]$

$-2 + 100i$, which corresponds to adding a minus sign in both terms.

B. $a \in [95, 100]$ and $b \in [20, 22]$

$98 + 20i$, which corresponds to adding a minus sign in the first term.

C. $a \in [-2, 1]$ and $b \in [-102, -98]$

* $-2 - 100i$, which is the correct option.

D. $a \in [95, 100]$ and $b \in [-23, -14]$

$98 - 20i$, which corresponds to adding a minus sign in the second term.

E. $a \in [46, 49]$ and $b \in [45, 53]$

$48 + 50i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

10. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-2 + 10i)(-9 + 6i)$$

The solution is $-42 - 102i$, which is option A.

A. $a \in [-44, -38]$ and $b \in [-105, -101]$

* $-42 - 102i$, which is the correct option.

B. $a \in [-44, -38]$ and $b \in [99, 103]$

$-42 + 102i$, which corresponds to adding a minus sign in both terms.

C. $a \in [16, 25]$ and $b \in [58, 61]$

$18 + 60i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

D. $a \in [78, 84]$ and $b \in [-84, -75]$

$78 - 78i$, which corresponds to adding a minus sign in the second term.

E. $a \in [78, 84]$ and $b \in [78, 83]$

$78 + 78i$, which corresponds to adding a minus sign in the first term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

11. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{1050}{0}} + \sqrt{210}i$$

The solution is Not a Complex Number, which is option A.

A. Not a Complex Number

* This is the correct option!

B. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

C. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

D. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

E. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

12. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{93636}{324}}$$

The solution is Integer, which is option E.

A. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

B. Irrational

These cannot be written as a fraction of Integers.

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

D. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

E. Integer

* This is the correct option!

General Comment: First, you **NEED** to simplify the expression. This question simplifies to -306.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

13. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{193600}{400}}$$

The solution is Whole, which is option E.

A. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

B. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

C. Irrational

These cannot be written as a fraction of Integers.

D. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

E. Whole

* This is the correct option!

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 440.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

14. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{63 - 55i}{3 + 2i}$$

The solution is $6.08 - 22.38i$, which is option A.

A. $a \in [5.5, 7]$ and $b \in [-23.5, -21]$

   * $6.08 - 22.38i$, which is the correct option.

B. $a \in [19.5, 22.5]$ and $b \in [-28.5, -26.5]$

   $21.00 - 27.50i$, which corresponds to just dividing the first term by the first term and the second by the second.

C. $a \in [5.5, 7]$ and $b \in [-293, -290.5]$

   $6.08 - 291.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

D. $a \in [22, 24]$ and $b \in [-3.5, -2.5]$

   $23.00 - 3.00i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

E. $a \in [78, 80.5]$ and $b \in [-23.5, -21]$

   $79.00 - 22.38i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

15. Simplify the expression below and choose the interval the simplification is contained within.

$$12 - 5^2 + 17 \div 16 * 4 \div 20$$

The solution is -12.787, which is option A.

A. $[-12.81, -12.66]$

   * -12.787, this is the correct option

B. $[37, 37.09]$

   37.013, which corresponds to two Order of Operations errors.

C. $[-13.16, -12.83]$

   -12.987, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

D. $[37.09, 37.36]$

   37.212, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

E. None of the above

   You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

16. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{72 + 66i}{-7 - i}$$

The solution is $-11.40 - 7.80i$, which is option D.

A. $a \in [-9.5, -8]$ and $b \in [-12, -9]$

$-8.76 - 10.68i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

B. $a \in [-12, -10.5]$ and $b \in [-390.5, -389]$

$-11.40 - 390.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [-571, -569.5]$ and $b \in [-8, -7]$

$-570.00 - 7.80i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

D. $a \in [-12, -10.5]$ and $b \in [-8, -7]$

* $-11.40 - 7.80i$, which is the correct option.

E. $a \in [-11, -9]$ and $b \in [-68, -65.5]$

$-10.29 - 66.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

17. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{2057}{11}} + \sqrt{110}i$$

The solution is Nonreal Complex, which is option D.

A. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

B. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

D. Nonreal Complex

* This is the correct option!

E. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

18. Simplify the expression below and choose the interval the simplification is contained within.

$$19 - 4^2 + 9 \div 3 * 17 \div 16$$

The solution is 6.188, which is option C.

A. $[33.42, 35.53]$

35.011, which corresponds to two Order of Operations errors.

B. $[2.16, 5.17]$

3.011, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

C. $[5.8, 7.07]$

* 6.188, this is the correct option

D. $[37.78, 38.61]$

38.188, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

19. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-5 + 10i)(-9 - 2i)$$

The solution is $65 - 80i$, which is option E.

A. $a \in [23, 27]$ and $b \in [-103, -98]$

$25 - 100i$, which corresponds to adding a minus sign in the second term.

B. $a \in [45, 46]$ and $b \in [-20, -19]$

$45 - 20i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

C. $a \in [23, 27]$ and $b \in [93, 104]$

$25 + 100i$, which corresponds to adding a minus sign in the first term.

D. $a \in [64, 66]$ and $b \in [78, 86]$

$65 + 80i$, which corresponds to adding a minus sign in both terms.

E. $a \in [64, 66]$ and $b \in [-89, -79]$

* $65 - 80i$, which is the correct option.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

20. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-6 - 2i)(4 + 9i)$$

The solution is $-6 - 62i$, which is option D.

A. $a \in [-42, -38]$ and $b \in [42, 47]$

$-42 + 46i$, which corresponds to adding a minus sign in the second term.

B. $a \in [-27, -22]$ and $b \in [-20, -17]$

$-24-18i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

C. $a \in [-11, -3]$ and $b \in [59, 64]$

$-6+62i$, which corresponds to adding a minus sign in both terms.

D. $a \in [-11, -3]$ and $b \in [-64, -59]$

* $-6-62i$, which is the correct option.

E. $a \in [-42, -38]$ and $b \in [-47, -42]$

$-42-46i$, which corresponds to adding a minus sign in the first term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

21. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{-605}{11}} + \sqrt{0}i$$

The solution is Pure Imaginary, which is option D.

A. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

B. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

C. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

D. Pure Imaginary

* This is the correct option!

E. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

22. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{100}{529}}$$

The solution is Rational, which is option A.

A. Rational

* This is the correct option!

B. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

C. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

D. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

E. Irrational

These cannot be written as a fraction of Integers.

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $-\frac{10}{23}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

23. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{25}{361}}$$

The solution is Rational, which is option D.

A. Irrational

These cannot be written as a fraction of Integers.

B. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

C. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

D. Rational

* This is the correct option!

E. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $-\frac{5}{19}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

24. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{-9 + 66i}{-3 - 8i}$$

The solution is $-6.86 - 3.70i$, which is option C.

A. $a \in [-7, -6.5]$ and $b \in [-270.5, -269.5]$

$-6.86 - 270.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

B. $a \in [7, 8]$ and $b \in [-3, -0.5]$

$7.60 - 1.73i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

C. $a \in [-7, -6.5]$ and $b \in [-5, -2.5]$

* $-6.86 - 3.70i$, which is the correct option.

D. $a \in [-502, -500.5]$ and $b \in [-5, -2.5]$

$-501.00 - 3.70i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [1.5, 4.5]$ and $b \in [-9, -8]$

$3.00 - 8.25i$, which corresponds to just dividing the first term by the first term and the second by the second.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

25. Simplify the expression below and choose the interval the simplification is contained within.

$$4 - 7 \div 17 * 2 - (6 * 19)$$

The solution is -110.824, which is option B.

A. $[-53.69, -53.25]$

-53.647, which corresponds to not distributing a negative correctly.

B. $[-111.58, -110.57]$

* -110.824, which is the correct option.

C. $[-110.65, -109.21]$

-110.206, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

D. $[117.44, 117.85]$

117.794, which corresponds to not distributing addition and subtraction correctly.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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26. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{27 - 77i}{6 - 5i}$$

The solution is $8.97 - 5.36i$, which is option E.

A. $a \in [3.5, 5]$ and $b \in [15, 16.5]$

$4.50 + 15.40i$, which corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [546, 547.5]$ and $b \in [-6.5, -5]$

$547.00 - 5.36i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

C. $a \in [-4, -3]$ and $b \in [-11, -9.5]$

$-3.66 - 9.79i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

D. $a \in [7.5, 9.5]$ and $b \in [-328.5, -326.5]$

$8.97 - 327.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

E. $a \in [7.5, 9.5]$ and $b \in [-6.5, -5]$

* $8.97 - 5.36i$, which is the correct option.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

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27. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{-567}{9}} + \sqrt{0}i$$

The solution is Pure Imaginary, which is option D.

A. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

B. Nonreal Complex

This is a Complex number ($a + bi$) that is not Real (has i as part of the number).

C. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

D. Pure Imaginary

* This is the correct option!

E. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

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28. Simplify the expression below and choose the interval the simplification is contained within.

$$1 - 19 \div 20 * 13 - (16 * 2)$$

The solution is -43.350, which is option D.

A. $[-34.07, -25.07]$

-31.073, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

B. $[30.93, 34.93]$

32.927, which corresponds to not distributing addition and subtraction correctly.

C. $[-57.7, -48.7]$

-54.700, which corresponds to not distributing a negative correctly.

D. $[-49.35, -36.35]$

* -43.350, which is the correct option.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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29. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(7 - 3i)(-5 - 2i)$$

The solution is $-41 + i$, which is option C.

A. $a \in [-42, -36]$ and $b \in [-1.04, -0.04]$

$-41 - i$, which corresponds to adding a minus sign in both terms.

B. $a \in [-33, -27]$ and $b \in [27.6, 29.73]$

$-29 + 29i$, which corresponds to adding a minus sign in the second term.

C. $a \in [-42, -36]$ and $b \in [0.39, 2.65]$

* $-41 + i$, which is the correct option.

D. $a \in [-37, -32]$ and $b \in [4.68, 7.26]$

$-35 + 6i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

E. $a \in [-33, -27]$ and $b \in [-29.61, -28.87]$

$-29 - 29i$, which corresponds to adding a minus sign in the first term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

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30. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-8 - 10i)(9 + 5i)$$

The solution is $-22 - 130i$, which is option A.

A. $a \in [-23, -17]$ and $b \in [-132, -123]$

* $-22 - 130i$, which is the correct option.

B. $a \in [-75, -64]$ and $b \in [-55, -49]$

$-72 - 50i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

C. $a \in [-23, -17]$ and $b \in [127, 131]$

$-22 + 130i$, which corresponds to adding a minus sign in both terms.

D. $a \in [-123, -118]$ and $b \in [45, 51]$

$-122 + 50i$, which corresponds to adding a minus sign in the first term.

E. $a \in [-123, -118]$ and $b \in [-55, -49]$

$-122 - 50i$, which corresponds to adding a minus sign in the second term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.
